
DEPARTMENT OF THE ARMY LRL-02270 (Feb 2001)
U.S. ARMY CORPS OF ENGINEERS -----
Supercedes
LRL-02270 (06/00)

GUIDE SPECIFICATION FOR CONSTRUCTION

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GUIDE SPECIFICATION FOR CONSTRUCTION

SECTION 02270

STONE PROTECTION 02/01

PART 1 GENERAL

1.1 SUMMARY

The work covered by this section consists of performing all operations in connection with the construction of stone protection (filter stone and riprap), gravel road, and relief drain aggregate, as shown on the drawings or as directed by the Contracting Officer, in accordance with these specifications and applicable drawings.

1.2 REFERENCES

1998 Kentucky Department of Transportation, Standard Specifications.

American Society for Testing Materials (ASTM)

C136-84	Sieve Analysis of Fine and Coarse Aggregate
C150-86	Portland Cement
C231-86	Air Content of Freshly Mixed Concrete by the Pressure Method
C260-86	Air-Entraining Admixtures for Concrete

1.3 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item on the project should be one of the primary factors in determining if a submittal for the items should be required.

Indicate submittal classification in the blank space following the name of the item requiring the submittal by using "G" when the submittal requires Government approval. Submittals not classified as "G" will show on the submittal register as "Information Only". For submittals requiring Government approval, a code of up to three characters should be used following the "G" designation to indicate the approving authority; codes of "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval are recommended.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sources; ; G,ED.

Source(s) from which the Contractor proposes to obtain the filter stone, relief drain aggregate, gravel road surface coarse and riprap shall be submitted to the Contracting Officer.

SD-06 Test Reports

Gradation Testing; ; G,ED.

Certified copies of current gradation tests for the riprap (Class II Channel Lining), filter stone (KY #3, #4 or #357), relief drain aggregate (KY #3) and gravel road surface coarse (DGA and KY #57) shall be submitted to the Contracting Officer.

1.4 PAYMENT

No separate payment will be made for the work included in this section for the riprap, filter stone and gravel road surface coarse or any associated material, equipment, and labor necessary to complete this work.

Payment will be made for the cost of the work associated with the placement of the relief drain aggregate as listed in the bid schedule "Relief Drain Aggregate" per cubic yard.

PAY ITEM

PAY UNIT

Relief Drain Aggregate Cubic Yard

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 SITE PREPARATION

All areas where riprap is required shall be cleared in accordance with section 02110, "CLEARING AND GRUBBING". Immediately prior to placing the riprap, the prepared base shall be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

3.2 RIPRAP PROTECTION

3.2.1 General

3.2.1.1 Approval

All riprap for the protection work shall be durable stone as approved by the Contracting Officer. Within 5 days after receipt of Notice to Proceed, the Contractor shall identify to the Contracting Officer the sources from which the Contractor proposes to obtain the protection stone for the work. The Contracting Officer will indicate to the Contractor, within 15 days of receipt of the identified sources, approval or disapproval of the proposed sources.

3.2.1.2 Limits of Placement

Riprap protection shall be placed within the limits shown on the plans or as otherwise required by the Contracting Officer.

3.2.2 Gradation

Riprap protection shall be reasonably well graded within the limits indicated below and as stated in Section 616 of the Kentucky Department of Transportation (KDOT) 1998 Standard Specifications:

Class II Channel Lining	
% Passing	Screen Size
100	225 mm
< 20	125 mm

Minimum Thickness 14 inches

3.2.3 Quality

Riprap protection must meet the specifications for Class II Channel Lining characteristics as stated in Section 805 of the KDOT 1998 Standard Specifications. Quality test data for the proposed sources shall be furnished. Test information shall be less than one year old.

3.2.4 Placement

Riprap protection shall be placed in such a manner as to produce a reasonably well graded mass of rock with the minimum practicable percentage

of voids, and shall be constructed to the lines and grades shown on the drawings or staked in the field. The stone fill must be placed starting at the toe of the slope. The fill shall be placed to full thickness and progress up the slope. This shall be done to prevent destabilizing the slope. Protection stone shall be placed to its full course thickness in one operation. The larger stone shall be well distributed and the entire mass of stones in their position shall be roughly graded to conform to the gradation specified in paragraph: Gradation hereinbefore. The finished stone protection shall be free from objectional pockets of small stones and clusters of larger stones. Placing some of the designated size in layers will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during the final placing; or by other methods of placement which will produce the specified results. Care shall be exercised when placing stone adjacent to existing trees, by protecting them using hand placement until there is adequate cover for protection. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well graded distribution of stone sizes as specified above. Tracked equipment will not be permitted on the riprap surface. The Contractor shall maintain the stone protection until accepted and any material displaced by any cause shall be replaced at this expense to the lines and grades shown on the drawings.

3.3 FILTER MATERIAL, RELIEF DRAIN AGGREGATE AND GRAVEL ROAD SURFACE COARSE

3.3.1 General

3.3.1.1 Approval

All filter stone, relief drain aggregate and gravel road surface coarse shall be durable stone as approved by the Contracting Officer. Within 5 days after receipt of Notice to Proceed, the Contractor shall identify to the Contracting Officer the sources from which the Contractor proposes to obtain the material for the work. The Contracting Officer will indicate to the Contractor, within 15 days of receipt of the identified sources, approval or disapproval of the proposed sources.

3.3.1.2 Limits of Placement

Filter stone, relief drain aggregate and gravel road surface coarse shall be placed within the limits shown on the plans or as otherwise required by the Contracting Officer.

3.3.2 Gradation

The gradation of the filter stone (KY #3, #4 or #357), relief drain aggregate (KY #3's) and gravel road surface coarse (DGA's and 57's) shall be in accordance with Section 805 the 1998 KDOT Standard Specifications.

KY #3

% Passing	Screen Size
100	2.5 in
35-70	1.5 in

0-15 1 in
Minimum Thickness 6 inches

KY #357
% Passing Screen Size
100 2.5 in
35-70 1 in
10-30 0.5 in
Minimum Thickness 6 inches

KY #4
% Passing Screen Size
100 2 in
20-55 1 in
0-15 0.75 in
Minimum Thickness 6 inches

KY DGA
% Passing Screen Size
100 1 in
50-80 3/8 in
8-30 No. 40
Minimum Thickness 6 inches

KY #57
% Passing Screen Size
100 1 1/2 in
25-60 1/2 in
0-10 No. 4
Minimum Thickness 2 inches

3.3.3 Placement

Filter stone, relief drain aggregate and gravel road surface coarse shall be spread uniformly on the prepared base, in a satisfactory manner, to the slope lines and grades indicated on the drawings. Placing of material by methods which will tend to segregate particle sizes within the filter layer will not be permitted. Tracked equipment will not be permitted on the riprap surface. Any damage to the surface of the base during placing of the filter material shall be repaired before proceeding with the work. Compaction of the filter layer will not be required, but it shall be finished to present a reasonably even surface free from mounds or windrows.

3.4 NOT USED.

3.5 TESTING PROGRAM

The Contractor shall perform gradation tests for the riprap utilizing the procedures described in the Test Method as prepared by the Louisville District for dumped samples bound at the end of this section of specifications. Testing shall be performed once at the source of stone prior to delivery to the site. Additional tests may be required to demonstrate compliance with the contract. The Contracting Officer may select the time and location of the required tests.

The Contractor shall perform gradation tests for each size of the filter stone, relief drain aggregate and gravel road surface coarse according to the Louisville District Test Method, once at the source prior to delivery and once at the placement site, as directed by the Contracting Officer.

3.6 GROUTING RIPRAP

3.6.1 General

Riprap shall be grouted where indicated on the drawings or otherwise required by the Contracting Officer. Grouting materials shall conform to the requirements in paragraph 3.6.2

3.6.2 Grouting

Grout shall be composed of cement, water, an air-entraining admixture, and sand mixed in the proportions of 1 part of portland cement to 3 parts of sand, sufficient water to produce a workable mixture, and that amount of admixture which will entrain sufficient air to produce durable grout, as determined by the Contracting Officer. The grout shall have an air content of 8 +/- 1.5% as measured by ASTM C-231. For grout batched at a central plant the following mix shall be used, subject to minor variations due to moisture in materials and specific gravity.

Cement	Sand	Free Water
(pounds)		(Gal per Bag)
846	2255	5

The grout shall be mixed in approved concrete or mortar mixer. Mixing time shall be as necessary to produce a mixture having a consistency such as to permit gravity flow into the interstices of the riprap with the help of limited rodding. The grout shall be used in the work within a period of ½ hour after mixing unless an approved retarder is used, in which case the grout shall be placed within 1-1/2 hours after mixing. Retempering the grout will not be permitted. Riprap shall not be grouted when the ambient temperature is below 34 degrees F. nor above 85 degrees F. unless approved by the Contracting Officer in writing; nor when these temperatures are predicted before final set has occurred. Prior to grouting, all surfaces of riprap shall be wetted. Grout shall be placed in final position into the voids between the larger stones by means of a tremie, pump hose, or similar procedure to the maximum practicable extent, supplemented by rodding. Grout on surfaced of the larger stones shall be removed with stiff stable brooms. Generally, grouting shall proceed up the slope and upstream. After completion, no workman nor any load shall be permitted on the grouted surface for a period of at least 24 hours. The grouted surface shall also be protected from rain and flowing water for a period of at least 24 hours. Grouted riprap shall be cured by keeping the surface continuously wet for a period of not less than 7 days.

3.6.3 Measurement

Grout for the riprap will be measured by the cubic yard. The quantity of grout required is determined to be (assuming penetration of the full layer

of riprap) 30% times the total volume of riprap to be placed on the job.

3.6.4 Payment

Payment for the work covered under this section of the specifications will be made at the contract unit price per cubic yard for Grout as listed in the Bid Schedule, which shall include all associated material, equipment, and labor necessary to complete the work.

LOUISVILLE DISTRICT TEST METHODS

STONE GRADATION TESTS

GENERAL.

The following test methods shall be used to determine the gradation of any stone product when the maximum size stone specified for that material exceeds 1.2 in. The methods herein cover both in-place and dumped sampling.

1. In-Place Method.

The in-place method is used to test the material placed as a final end product. In this method a location is selected on the surface of the lift, layer, or course and a surface area the size of which is determined by the maximum size stone specified, (see para 3) is clearly marked delineating the test area. All stone within this area and for the full depth of the layer, course or lift shall be removed and the gradation of the stone within the area is measured and/or weighed to determine the in-place gradation. Care must be taken to insure that all material being tested is removed from the area and material outside of or below the area is not incorporated in the sample.

2. Dumped Sample.

The dumped sampling method consists of selecting a random load prior to the placing operation. Care should be taken to prevent contamination of the sample or loss of material by dumping the sample on a tarp or plywood. The minimum size of this sample shall be determined by the maximum size stone specified for this material. These size - quantity requirements are shown in para 3. This sample should reflect all production, processing and loading methods in effect at that time to produce the material for the final specified product.

3. Sample Size.

Approximate Sample Quantity

<u>Maximum Size Stone</u>	<u>Dumped</u>	<u>In-Place</u>
10 in. or less	8-10 tons	6x6 ft
10-16 in.	10-12 tons	10x10 ft

4. Recording Test.

The results of this test will be recorded and calculated in the form presented below.

STONE GRADATION TEST

Material: _____ Total Weight of Sample:

Location (in-place):

<u>RIPRAP</u>		<u>Class II Channel Lining</u>
		<u>Specification</u>
<u>Screen Size</u>	<u>% Passing</u>	<u>Requirements</u>
9 in		90-100%
5 in		< 20%

FILTER STONE, RELIEF DRAIN AGGREGATE AND GRAVEL ROAD SURFACE COARSE

KY #3		
<u>Specification</u>		
<u>Screen Size</u>	<u>% Passing</u>	<u>Requirements</u>
2.5 in		100%
1.5 in		35-70%
1 in		0-15%

KY #357		
<u>Specification</u>		
<u>Screen Size</u>	<u>% Passing</u>	<u>Requirements</u>
2.5 in		100%
1 in		35-70%
0.5 in		10-30%

KY #4		
<u>Specification</u>		
<u>Screen Size</u>	<u>% Passing</u>	<u>Requirements</u>
2 in		100%
1 in		35-70%
0.75 in		10-30%

KY DGA		
<u>Specification</u>		
<u>Screen Size</u>	<u>% Passing</u>	<u>Requirements</u>
1 in		100%
3/8 in		50-80%
No. 40		8-30%

KY #57		
<u>Specification</u>		
<u>Screen Size</u>	<u>% Passing</u>	<u>Requirements</u>
1 1/2 in		100%
1/2 in		25-60%
No. 4		0-10%

ENG Forms 4055 and 4056 or similar will be used to plot resultant curves.

5. The Contractor shall provide the following equipment:

- (1) Portable platform scale (+200 lb capacity)
- (1) Tarps or plywood
- (1) Set rigid steel squares. Welded rod sufficiently rigid to hold

required dimensions.

6. An initial gradation test for approval shall be performed from a stockpile at the stone source by the Contractor at the direction of the Contracting Officer.

-- End of Section --